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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,042	04/08/2004	Thomas C. Tiearney JR.	GEMS0239PA	3041

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ARTZ & ARTZ, P.C.
28333 TELEGRAPH RD.
SUITE 250
SOUTHFIELD, MI 48034

EXAMINER	
KIKNADZE, IRAKLI	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 03/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/709,042	TIEARNEY ET AL.	
	Examiner	**Art Unit**	
	Irakli Kiknadze	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☒ Claim(s) *28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. In response to the Office action dated September 15, 2005 the Amendment has been received on January 9, 2006.

Claims 17-24 have been canceled.

Claims 25-28 have been newly added.

Claims 1-16 and 25-28 are currently pending in this application.

Response to Arguments

2. Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-5 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lounsberry et al. (US Patent 4,573,185) in view of Love et al. (US Patent 4,109,058).

With respect to claims 1-5,16, 25 and 26, Lounsberry teaches a lightweight rotating x-ray anode comprising (Fig. 1) a graphite substrate material (12); a refractory metal target material such as tungsten or tungsten rhenium alloy (18); a CTE material layer of rhenium (21) coupling the substrate material (12) to the target material (18) (column 3, lines 4-32). Lounsberry fails to teach graded CTE material layer. Love teaches x-ray anodes having graded surface layer. The first outer surface layer on which the electron beam impinges is a tungsten-rhenium alloy. Below the first layer is a second graded layer which comprises tungsten-rhenium and molybdenum. The content of molybdenum in the second layer diminishes in the direction of the first layer and, conversely, the content of rhenium diminishes in the direction of a substrate (column 2, lines 47-55). In this arrangement the graded layer constitutes a graded CTE layer since the layer will exhibit an increasing or reducing coefficient of thermal expansion properties based on the composition of the materials (tungsten-rhenium and molybdenum) through the layer in the direction of substrate or target within the layer. Additionally, the layer would accommodate overstress due to thermal expansion between the substrate material and the target. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ teachings of the layer having graded composition as suggested by Love in the x-ray anode of Lounsberry, since such a modification would extend overall service time of the x-ray anode by accommodating overstress due to thermal expansion between the substrate material and the target.

5. Claims 1-5, 9, 16, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Truszkowska (US Patent 5,875,228) in view of Love et al. (US Patent 4,109,058).

With respect to claims 1-5, 16, 25 and 26, Truszkowska teaches a lightweight rotating x-ray anode comprising (Fig.2) a substrate material such as carbon-carbon composite fiber (20); a refractory metal target material such as tungsten alloy (22); a CTE material layer (24) coupling the substrate material (20) to the target material (22). The CTE material layer is layered sequentially from the substrate material and layered horizontally from the substrate surface (column 4, lines 15-37). Truszkowska fails to teach graded CTE material layer. Love teaches x-ray anodes having graded surface layer. The first outer surface layer on which the electron beam impinges is a tungsten-rhenium alloy. Below the first layer is a second graded layer which comprises tungsten-rhenium and molybdenum. The content of molybdenum in the second layer diminishes in the direction of the first layer and, conversely, the content of rhenium diminishes in the direction of a substrate (column 2, lines 47-55). In this arrangement the graded layer constitutes a graded CTE layer since the layer will exhibit an increasing or reducing coefficient of thermal expansion properties based on the composition of the materials (tungsten-rhenium and molybdenum) through the layer in the direction of substrate or target within the layer. Additionally, the layer would accommodate overstress due to thermal expansion between the substrate material and the target. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ teachings of the layer having graded composition as suggested by Love in the x-ray

anode of Truszkowska, since such a modification would extend overall service time of the anode by accommodating overstress due to thermal expansion between the substrate material and the target.

With respect to claim 9, Truszkowska as modified by Love teaches claimed invention except for the CTE material layer having an approximate coefficient of thermal expansion averaging between each of the adjacent materials. It would have been obvious to one of ordinary skill in art at the time the invention was made to use the CTE material having the approximate coefficient of thermal expansion averaging between each of the adjacent materials in the x-ray anode of Truszkovska as modified by Love, since such a modification would to gradually relive the thermal expansion mismatch stress between carbonaceous material of the anode substrate and refractory metal of a focal track of the target.

6. Claims 1-8, 10-13 and 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horner et al. (US Patent Application Publication No. 2003/0006269 A1) in view of Love et al. (US Patent 4,109,058).

With respect to claims 1-6, 10, 25 and 26, Horner teaches a lightweight x-ray anode comprising a substrate material such as carbon-carbon composite fiber; a refractory metal target material such as tungsten alloy or molybdenum alloy; a CTE material layer coupling the substrate material to the target material ([0009];[0010]; [0015] and [0016]). Horner fails to teach graded CTE material layer. Love teaches x-ray anodes having graded surface layer. The first outer surface layer on which the electron beam impinges is a tungsten-rhenium alloy. Below the first layer is a second graded

layer which comprises tungsten-rhenium and molybdenum. The content of molybdenum in the second layer diminishes in the direction of the first layer and, conversely, the content of rhenium diminishes in the direction of a substrate (column 2, lines 47-55). In this arrangement the graded layer constitutes a graded CTE layer since the layer will exhibit an increasing or reducing coefficient of thermal expansion properties based on the composition of the materials (tungsten-rhenium and molybdenum) through the layer in the direction of substrate or target within the layer. Additionally, the layer would accommodate overstress due to thermal expansion between the substrate material and the target. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ teachings of the layer having graded composition as suggested by Love in the x-ray anode of Horner, since such a modification would extend overall service time of the anode by accommodating overstress due to thermal expansion between the substrate material and the target.

With respect to claims 7 and 8, Horner teaches providing the layers of the CTE material sequentially or horizontally from the substrate surface ([0052]; [0054], lines 1-4)

With respect to claims 11-13, Horner as modified by Love teaches that the graded material layer has a different coefficient of thermal expansion but fails to teach that differing coefficient of thermal expansion is $2x10^{-6}/°C$ or $1x10^{-6}/°C$ or less than $1x10^{-6}/°C$. A layer of a graded material comprising a mixture of particles of a refractory metal provides a layer with the graded coefficient of thermal expansion to form an intermediate barrier reliving the thermal expansion mismatch stress between the anode substrate and refractory metal of a focal track of the target. It would have been obvious

to one of ordinary skill in art at the time the invention was made to employ the CTE material layer having the specific differing coefficient of thermal expansion, such as $2x10^{-6}/°C$ or $1x10^{-6}/°C$ or less than $1x10^{-6}/°C$, as claimed in claims 11-13, to accommodate specific anode substrate/target material arrangement that gradually relives the thermal expansion mismatch stress between the anode substrate and refractory metal of a focal track of the target.

With respect to claim 27, Horner teaches an x-ray anode comprising: a CTE material layer; a substrate material having a target location coated with a slurry mixture and dried, thereby forming the CTE material layer ([0025], lines 1-18); and a target material deposited upon the CTE material layer ([0028]), wherein the CTE material layer, the substrate material and the target material are bonded ([0051]; [0054]). Horner fails to teach graded CTE material layer. Love teaches x-ray anodes having graded surface layer. The first outer surface layer on which the electron beam impinges is a tungsten-rhenium alloy. Below the first layer is a second graded layer which comprises tungsten-rhenium and molybdenum. The content of molybdenum in the second layer diminishes in the direction of the first layer and, conversely, the content of rhenium diminishes in the direction of a substrate (column 2, lines 47-55). In this arrangement the graded layer constitutes a graded CTE layer since the layer will exhibit an increasing or reducing coefficient of thermal expansion properties based on the composition of the materials (tungsten-rhenium and molybdenum) through the layer in the direction of substrate or target within the layer. Additionally, the layer would accommodate overstress due to thermal expansion between the substrate material and

the target. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ teachings of the layer having graded composition as suggested by Love in the x-ray anode of Horner, since such a modification would extend overall service time of the anode by accommodating overstress due to thermal expansion between the substrate material and the target.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Truszkowska (US Patent 5,875,228) and Love et al. (US Patent 4,109,058) as applied to claim 1 above, and further in view of Horner et al. (US Patent Application Publication No. 2003/0006269 A1).

With respect to claim 6, Truszkovska as modified by Love teaches claimed invention except that the target material is a molybdenum alloy. Horner teaches an x-ray anode made from tungsten alloy or molybdenum alloy on graphite or a carbon-carbon ([0017]; lines 1-5) composite support. These materials have great strength and are readily commercially available ([0019]; lines 13-25). It would have been obvious to one of ordinary skill in art at the time the invention was made to employ Molybdenum alloy for equally alternative target material as suggested by Horner in the x-ray anode of apparatus Truszkovska as modified by Love, since such modification would providing the durable and readily commercially available x-ray target while not changing the scope of the invention.

8. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horner et al. (US Patent Application Publication No. 2003/0006269

A1) and Love (US Patent 4,109,058) applied to claim 1 above, and further in view of Lewis et al. (US Patent 6,395,220 B1).

With respect to claim 14 and 15, Horner as modified by Love teaches that the CTE material layer comprises tungsten, tungsten borides, tungsten carbides, molybdenum, molybdenum borides, and molybdenum carbides ([0010]) but fails to teach chopped carbon fiber. Lewis teaches chopped pitch fiber, wherein varying the coefficient of thermal expansion is achieved by altering the proportions of the carbon fiber material (column 2, lines 1-10). This invention using novel binder pitch provides a desirably lower transverse and longitudinal coefficient of thermal expansion than conventionally made graphite bodies (column 1, lines 5-11). It would have been obvious to one of ordinary skill in art at the time the invention was made to employ the CTE material layers with chopped carbon fiber in the x-ray anode to further relive the thermal expansion mismatch stress between carbonaceous material of the anode substrate and refractory metal of a focal track of the target.

Allowable Subject Matter

9. Claim 28 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: With respect to claim 28, the prior art fails to teach or make obvious an

x-ray anode comprising a slurry mixture for forming each of the graded CTE material layers having different CTE determined by the percentage of carbon in the slurry mixture as claimed including all of the limitations of the base claim and any intervening claims.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Irakli Kiknadze whose telephone number is 571-272-2493. The examiner can normally be reached on 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on 571-272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Irakli Kiknadze
March 13, 2006
IK

EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER